Patterns of Comorbidity, Functioning, and Service Use for US Children With ADHD, 2007

WHAT'S KNOWN ON THIS SUBJECT: Attention-deficit/hyperactivity disorder (ADHD) is known to be associated with a range of mental health and neurodevelopmental comorbidities, but the pattern of these comorbidities and their relationship to child and family functioning and service use at the population level investigated has not been found in previous studies.

WHAT THIS STUDY ADDS: Two-thirds of US children with ADHD have comorbid conditions. Social and educational functioning declines with more comorbidities and cross-sector service use and need for care coordination increase. Management of ADHD should be tailored to each child's neurodevelopmental profile.

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abstract

OBJECTIVE: To determine patterns of comorbidity, functioning, and service use for US children with attention-deficit/hyperactivity disorder (ADHD).

METHODS: Bivariate and multivariable cross-sectional analyses were conducted on data from the 2007 National Survey of Children's Health on 61 779 children ages 6 to 17 years, including 5028 with ADHD.

RESULTS: Parent-reported diagnosed prevalence of ADHD was 8.2%. Children with ADHD were more likely to have other mental health and neurodevelopmental conditions. Parents reported that 46% of children with ADHD had a learning disability versus 5% without ADHD, 27% vs 2% had a conduct disorder, 18% vs 2% anxiety, 14% vs 1% depression, and 12% vs 3% speech problems (all $P < .05$). Most children with ADHD had at least 1 comorbid disorder: 33% had 1, 16% had 2, and 18% had 3 or more. The risk for having 3 or more comorbidities was 3.8 times higher for poor versus affluent children (30% vs 8%). Children with ADHD had higher odds of activity restriction (odds ratio: 4.14 [95% confidence interval: 3.34–5.15]), school problems (odds ratio: 5.18 [95% confidence interval: 4.47–6.01]), grade repetition, and poor parent-child communication, whereas social competence scores were lower and parent aggravation higher. Functioning declined in a stepwise fashion with increasing numbers of comorbidities, and use of health and educational services and need for care coordination increased.

CONCLUSIONS: Clinical management of ADHD must address multiple comorbid conditions and manage a range of adverse functional outcomes. Therapeutic approaches should be responsive to each child's neurodevelopmental profile, tailored to their unique social and family circumstances, and integrated with educational, mental health and social support services. *Pediatrics* 2011;127:462–470

Attention-deficit/hyperactivity disorder (ADHD) is 1 of the most common cognitive and behavioral disorders currently diagnosed in US children of school age,[1] with an estimated annual societal cost of $34 billion to $52 billion.[2] Children with ADHD have elevated problems in many areas, including academic functioning and strained social and family relationships.[3,4] Studies also show that children with ADHD commonly exhibit additional mental health and neurodevelopmental comorbidities, including learning disabilities,[5–7] epilepsy,[8] tic and communication disorders,[9–11] conduct disorder,[4,12] anxiety,[13,14] and depression.[15] Presence of comorbidities has, in turn, been associated with poorer functioning in social and educational domains.[14,16–19] However, most existing studies of children with ADHD have been conducted on clinic-based or small-scale community samples that are not representative of the general population of children in the US and do not use adequate samples to measure the effect of multiple comorbidities.[20]

It is essential to understand patterns of comorbidity, functioning, and service use among children with ADHD so services can be designed to meet the population's needs, and clinicians can be optimally responsive to patterns of illness they are likely to encounter in practice. Understanding the functional impact of ADHD also provides an indication of how well the existing system of care is performing. This study uses data from the 2007 National Survey of Children's Health (NSCH) to examine patterns of comorbidity, functioning, and service use for US children with ADHD. We chose comorbid conditions based on prior studies suggesting possible associations with ADHD and measures of function and service use that best encompassed health, education, and social domains. This is the first US population-based study to examine as-

sociations between ADHD and a comprehensive set of comorbidities, and to address the relationship between multiple comorbidities and functioning and service use. We hypothesized that comorbidities would be highly prevalent among children with ADHD, and that each additional comorbidity would be associated with worse functioning and greater service use across health, educational, and social domains.

METHODS

Sample

The 2007 NSCH was conducted by the National Center for Health Statistics as a module of the State and Local Area Integrated Telephone Survey. The NSCH used a stratified random-digit-dial sampling design to achieve a nationally representative sample of 91 642 parents of children aged 0 to17. One child was randomly selected from each household, and a detailed telephone interview was conducted with the parent or guardian who knew the most about the child's health and health care. Interviews of ∼30 minutes were conducted in English and Spanish. The overall weighted response rate (American Association for Public Opinion Research rate 4) was 51.2%, assuming that telephone numbers that rang with no answer or were busy on all call attempts were nonresidential.

The study sample includes 64 076 children ages 6 to 17 from the NSCH. The sample was further restricted to include only individuals with no missing data on the study covariates, except household income, which was multiply imputed by National Center for Health Statistics statisticians and applied to our analyses.[21] This produces a sample size of $N = 61\ 779$ children. There is a small amount of variability in sample size for different functioning and service use measures because of missing

data on the outcome. The sample size never dipped below 59 941. A total of 5028 children were available for the analyses that examine factors associated with outcomes for children with ADHD.

To produce population-based estimates, data records were assigned a sampling weight. NSCH weights were designed to minimize bias by incorporating adjustments for various forms of survey nonresponse, including poststratification so the sample matches population control totals on key demographic variables obtained from the American Community Survey. Additional details on the NSCH design are reported elsewhere.[21] This study was exempted by the University of California, Los Angeles, institutional review board.

Measures

ADHD and Comorbid Disorders

Parents were asked if a doctor or health care provider ever told them that their child had ADHD, and if so, if their child currently had ADHD. Children were identified as having ADHD if parents responded "yes" to both questions. Ten potential comorbid disorders were identified in the same manner: learning disability; conduct disorder; anxiety; depression; speech problems; autism spectrum disorder; hearing problems; epilepsy or seizures; vision problems; and Tourette's syndrome.

Child and Family Functioning

Parents reported an activity restriction if the child was "limited or prevented in his/her ability to do things most children of the same age can do." School functioning was assessed by parent report of a contact in the past year by the school about problems and if the child ever repeated a grade. Social competence was measured by parent ratings (0: never; 1: rarely; 2:

sometimes; 3: usually; 4: always) of how often the child does the following: shows respect for teachers and neighbors; gets along well with other children; tries to understand others' feelings; and tries to resolve conflicts. Items were summed to create a composite, with higher scores indicating more competence. This scale has strong internal validity, good reliability, and predicts other indicators of positive behavior.[22]

The Aggravation in Parenting scale[23] measures stress in parenting by asking how often the child was much harder to care for than others, does things that really bothers them, and made them feel angry (0: never; 1: rarely; 2: sometimes; 3: usually; 4: always). Items were summed to create a scale ranging from 0 to 12. This measure has been used across multiple previous studies and has good reliability and construct validity.[23] Scales were analyzed as continuous and as indicators of low social competence (bottom 20%; score < 12) and high parent aggravation (top 20%; score > 4). Parent-child communication was assessed by parent report of how well they can "share ideas or talk about things that really matter." Responses were dichotomized as "very well/somewhat well" versus "not very well/not well at all."

Service Use

Measures of health and educational service use include parent report of any preventive health visit in the past year, any mental health visit in the past year, and whether the child received special education. Parents also reported if they needed "extra help arranging or coordinating care" across different service providers in the previous year.

Study Covariates

Study covariates include household income (<100% federal poverty level [FPL], 100–199% FPL, 200–299% FPL,

300–399% FPL, and ≥400% FPL), family structure, race/ethnicity, highest parent education, child age in years, child gender, and global child health status.

Analysis

All statistical analyses were performed using Stata 11.0 (Stata Corp, College Station, TX). Survey estimation procedures were applied, and the Taylor-series linearization method adjusted the SEs for the complex survey design. χ^2 tests were calculated to compare prevalence of comorbid disorders for children with ADHD versus those without, and relative risks were adjusted for sociodemographics. For children with ADHD, we constructed a comorbidity index, which counts the total number of comorbid conditions (range: 0–3 or more).

Child and family functioning and service use were analyzed in relation to the presence of an ADHD diagnosis and the number of comorbid conditions. χ^2 and analysis of variance tests were used to evaluate differences between children with and without ADHD, and also to examine associations between comorbidity and functioning and service use for children with ADHD. Logistic and linear regression models added controls for sociodemographics and global child health status.

TABLE 1 Prevalence of Comorbid Disorders for Children With ADHD Versus Those Without ($N = 61\ 779$)

	No ADHD	ADHD	Adjusted Relative Risk[b]	95% CI
Learning disability (%)	5.3	46.1[a]	7.79	6.86–8.86
Conduct disorder (%)	1.8	27.4[a]	12.58	10.23–15.48
Anxiety (%)	2.1	17.8[a]	7.45	6.08–9.12
Depression (%)	1.4	13.9[a]	8.04	6.09–10.62
Speech problem (%)	2.5	11.8[a]	4.42	3.41–5.73
Autism spectrum disorder (%)	0.6	6.0[a]	8.72	5.97–12.72
Hearing problem (%)	1.2	4.2[a]	2.77	1.87–4.11
Epilepsy or seizures (%)	0.6	2.6[a]	3.93	2.19–7.06
Vision problem (%)	1.4	2.3[a]	1.47	0.98–2.20
Tourette's syndrome (%)	0.09	1.3[a]	10.70	4.72–24.23
Any MH/ND disorder (%)	11.5	66.9[a]	5.12	4.72–5.55

[a] $P < .05$ for χ^2 test.
[b] Relative risks were adjusted for child age, gender, race/ethnicity, parent education, household income, and family structure.

RESULTS

ADHD Prevalence and Comorbidity

Parent-reported diagnosed prevalence of ADHD for all children ages 6 to 17 was 8.2% (95% confidence interval [CI]: 7.7–8.7), corresponding with more than 4 010 000 cases nationwide. Children with ADHD were more likely to also have each of 10 other mental health and neurodevelopmental disorders (Table 1). For example, 46% of children with ADHD had a learning disability versus 5% without ADHD, 27% vs 2% had a conduct disorder, 18% vs 2% anxiety, 14% vs 1% depression, and 12% vs 3% speech problems. Nine of the associations remained significant after adjustment for sociodemographics. In total, 67% of children with ADHD had at least 1 other reported mental health/neurodevelopmental disorder (compared with 11% in the population without ADHD). Among children with an ADHD diagnosis, 33% had 1 comorbid disorder, 16% had 2, and 18% had 3 or more (Fig 1).

Sociodemographics of ADHD Prevalence and Comorbidity

Parent-reported diagnosed prevalence of ADHD was higher for children in lower income households and families headed by single mothers (Table 2). The income gradient in ADHD prevalence was less
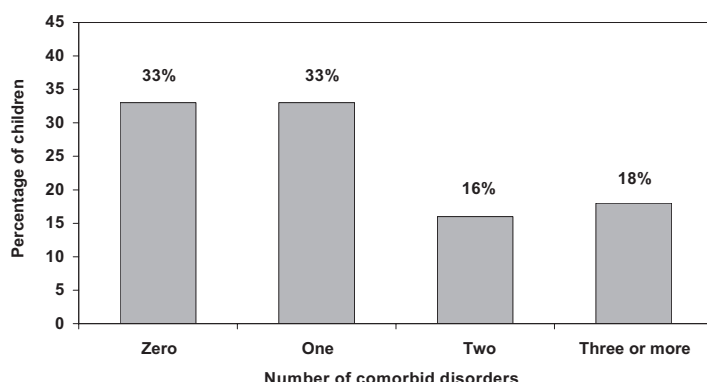
FIGURE 1
Percentage of children with ADHD who have comorbid disorders ($N = 5\,028$).

TABLE 2 Sociodemographic Correlates of ADHD Prevalence and Comorbidity

	ADHD (%) ($N = 61\,779$) $\pm$	>3 Comorbid Disorders (%) ($N = 5028$)
Household income		
<100% FPL	10[a]	30[a]
100–199% FPL	8	20
200–299% FPL	8	21
300–399% FPL	7	12
400% FPL or greater	7	8
Family structure		
Two biological/adoptive parents	6[a]	16
Single mother	12	22
Other	11	21
Race/ethnicity		
White	9[a]	16[a]
Black	9	19
Hispanic	5	28
Multiracial/other	7	20
Highest parent education		
High school diploma	9[a]	24[a]
More than high school	7	15
Child age, y		
6–9	6[a]	19
10–13	9	21
14–17	9	15
Child gender		
Male	11[a]	19
Female	4	17

[a] $P < .05$ for χ^2 test.

steep than the gradient for comorbidity. Children in poor families were ~1.4 times more likely to have an ADHD diagnosis than were children with incomes at 400% FPL or greater (10% vs 7%). The risk for having 3 or more comorbid conditions among children with ADHD was 3.8 times higher for poor versus most affluent children

(30% vs 8%). Separate analyses (not shown) indicated each comorbid condition except anxiety and epilepsy, and Tourette's was more common for poor children. Hispanic children were less likely than were white children to have an ADHD diagnosis, but more likely to have comorbid conditions. Comorbidity did not vary by child age or gender.

Associations Between ADHD, Comorbid Conditions, and Functioning

Children with ADHD had more reported problems across every indicator of functioning (Table 3). For example, 69% of parents with children who had ADHD were contacted about school problems, compared with 27% of other parents. Twenty-nine percent of children with ADHD had repeated a grade, compared with 9% of children without ADHD. Average parent aggravation scores were 4.9 for those with ADHD versus 2.9 for those without (53% vs 19% classified in high range).

Child and family functioning was distributed by the number of comorbid disorders for children with ADHD. Children with ADHD and 3 or more comorbid disorders exhibited severe deficits in functioning. For example, 59% of these children had an activity restriction, 81% had problems in school, 46% repeated a grade, 61% had low social competence, and 83% had parent aggravation scores classified as high.

Associations between ADHD and functioning remained significant in adjusted regression models. Children with ADHD had higher odds of activity restriction (odds ratio [OR]: 4.14 [95% CI: 3.34–5.15]), school problems (OR: 5.18 [95% CI: 4.47–6.01]), grade repetition, and poor communication, whereas social competence scores were lower and parent aggravation higher. For children with ADHD, the odds/β of poorer functioning increased in a step-wise fashion with increasing numbers of comorbidities (see Table 3). For example, compared with children with ADHD and no comorbid conditions, children with 3 or more comorbid disorders had the highest odds of activity restriction (OR: 12.58 [95% CI: 7.20–21.96]), whereas children with 2 (OR: 5.72 [95% CI: 3.17–10.33]) and 1 comorbid disorder

TABLE 3 Bivariate and Multivariable Associations Between ADHD, No. of Comorbid Disorders, and Child and Family Functioning

	No ADHD (N = 56 751)[a]	ADHD (N = 5028)[a]	No. of Comorbid Disorders (N = 5028)[a]			
			0	1	2	3 or More
Bivariate						
Activity restriction (%)	5	24[b]	7	16	34	59[b]
School problems (%)	27	69[b]	57	68	81	81[b]
Repeat grade (%)	9	29[b]	17	32	32	46[b]
Social competence (mean)	13.3	11.5[b]	12.2	11.7	11.2	10.1[b]
Low social competence (%)	18	43[b]	33	43	45	61[b]
Parent aggravation (mean)	2.9	4.9[b]	4.1	4.6	5.1	6.5[b]
High parent aggravation (%)	19	53[b]	40	48	56	83[b]
Poor communication (%)	3	8[b]	2	6	6	21[b]
Multivariable[c]						
Activity restriction OR (95% CI)	—	4.14[b] (3.34–5.15)	—	2.35[b] (1.31–4.21)	5.72[b] (3.17–10.33)	12.58[b] (7.20–21.96)
School problems OR (95% CI)	—	5.18[b] (4.47–6.01)	—	1.49[b] (1.08–2.06)	2.58[b] (1.70–3.91)	2.45[b] (1.56–3.86)
Repeat grade OR (95% CI)	—	3.71[b] (3.02–4.55)	—	2.14[b] (1.38–3.29)	2.07[b] (1.35–3.18)	3.01[b] (1.93–4.70)
Social competence β (SE)	—	−1.50[b] (0.10)	—	−0.40 (0.22)	−0.61[b] (0.26)	−1.67[b] (0.29)
Low social competence OR (95% CI)	—	2.86[b] (2.46–3.31)	—	1.42 (0.99–2.04)	1.35 (0.89–2.05)	2.41[b] (1.55–3.77)
Parent aggravation β (SE)	—	1.80[b] (0.08)	—	0.38 (0.19)	0.70[b] (0.24)	1.96[b] (0.23)
High parent aggravation OR (95% CI)	—	4.30[b] (3.72–4.98)	—	1.37 (0.98–1.92)	1.67[b] (1.13–2.47)	6.25[b] (4.03–9.64)
Poor communication OR (95% CI)	—	2.55[b] (1.84–3.52)	—	2.39[b] (1.18–4.84)	2.01[b] (1.02–3.99)	8.53[b] (4.41–16.52)

[a] Sample size varies slightly across different child and family functioning measures because of missing data on the outcome.
[b] $P < .05$. Bivariate results are based on χ^2 tests for dichotomous outcomes and analysis of variance for continuous outcomes.
[c] Models include controls for child age, gender, race/ethnicity, parent education, household income, family structure, and global child health status.

(OR: 2.35 [95% CI: 1.31–4.21]) had intermediate odds.

Income Gradients in Functioning

Among those with ADHD, functioning was consistently lower for children in lower-income households (see Table 4). For example, children with ADHD who lived in poverty had a 44% prevalence of grade repetition, compared with 19% for those who had family incomes of 400% FPL or greater. Among poor children with ADHD, 52% had low social competence scores versus 34% for the most affluent. These associations remained significant with controls for sociodemographics (not shown).

Associations Between ADHD, Comorbid Conditions, and Service Use

Children with ADHD consistently used more health, mental health, and education services than did other children (Table 5). Separate analyses (not shown) indicated that children with ADHD had higher health and mental health service use than did children with any other mental health or neurodevelopmental disorder. Among children with ADHD, mental health and education service use increased with each additional comorbid condition. For example, odds of special education use increased by 5.27 (95% CI: 3.55–7.82) with 1 comorbidity, 8.80 (95% CI: 5.58–13.87) with 2, and 16.04 (95% CI: 9.84–26.14) with 3. Most children with ADHD plus 3 or more comorbidities used each service, and nearly half of parents (42%) reported a need for more assistance with care coordination among the providers.

DISCUSSION

In 2007, ADHD was diagnosed for 8.2% of school-aged children in the US, corresponding to slightly more than 4 million cases nationwide. ADHD was significantly associated with all 10 mental health and neurodevelopmental conditions studied. The majority (67%) of children with ADHD had at least 1 other comorbidity. Almost one-fifth of children with ADHD had complex clinical pictures, with 3 or more comorbidities. The odds of poorer functioning, use of health and education services, and need for care coordination increased in a step-wise fashion with in-

TABLE 4 Income Gradients in Child and Family Functioning Among Those With ADHD (N = 5028)[a]

Functional Health Outcomes	Household Income Level				
	Below 100% FPL	100–199% FPL	200–299% FPL	300–399% FPL	400% FPL or Greater
Activity restriction (%)	31	28	24	17	17[b]
School problems (%)	77	72	66	71	61[b]
Repeat grade (%)	44	32	32	17	19[b]
Social competence (mean)	10.9	11.3	11.5	11.4	12.1[b]
Low social competence (%)	52	46	46	41	34[b]
Parent aggravation (mean)	5.3	5.0	4.8	4.8	4.5[b]
High parent aggravation (%)	58	59	53	52	45[b]
Poor communication (%)	10	9	7	10	3[b]

[a] Sample size varies slightly across different child and family functioning measures because of missing data on the outcome.
[b] $P < .05$ based on χ^2 tests for dichotomous outcomes and analysis of variance for continuous outcomes.

TABLE 5 Health and Educational Service Use by ADHD Status and No. of Comorbid Disorders

	No ADHD (N = 56 751)[a]	ADHD (N = 5028)[a]	No. of Comorbid Disorders (N = 5028)[a]			
			0	1	2	3 or More
Bivariate						
Preventive health visit	84	92[a]	90	93	94	93
Mental health visit	6	48[b]	35	42	60	72[b]
Special education services	7	49[b]	19	55	68	79[b]
Needed care coordination	8	20[b]	9	18	24	42[b]
Multivariable[c]						
Preventive health visit OR (95% CI)	—	2.19[b] (1.69–2.83)	—	1.38 (0.81–2.36)	1.58 (0.82–3.04)	1.24 (0.62–2.50)
Mental health visit OR (95% CI)	—	11.42[b] (9.63–13.55)	—	1.33 (0.94–1.88)	2.73[b] (1.82–4.09)	4.55[b] (2.93–7.04)
Special education services OR (95% CI)	—	9.88[b] (8.34–11.69)	—	5.27[b] (3.55–7.82)	8.80[b] (5.58–13.87)	16.04[b] (9.84–26.14)
Needed care coordination OR (95% CI)	—	3.01[b] (2.38–3.80)	—	1.87 (0.98–3.58)	2.52[b] (1.27–4.99)	4.51[b] (2.21–9.21)

[a] Sample size varies slightly across different service use measures because of missing data on the outcome.

[b] $P < .05$. Bivariate results are based on χ^2 tests.

[c] Models include controls for child age, gender, race/ethnicity, parent education, household income, family structure, and global child health status.

creasing numbers of comorbidities. These results have important implications for the organization and delivery of health care services for children with ADHD.

The parent-reported diagnosed prevalence of ADHD from the 2007 NSCH is comparable with that obtained in other studies, and matches more direct assessment from the National Health and Nutrition Examination Survey, 2001 to 2004 (8.7%).[24,25] Rates of comorbidities reported in the literature have varied widely, owing to differing definitions of comorbid conditions, ages of the study cohorts, and origin of samples.[13,26,27] Our estimate of a 67% comorbidity rate is consistent with 2 clinical samples in the US and Canada in which approximately two-thirds of children reported comorbid conditions.[13,17] These findings support an emerging view that "pure" ADHD, in the absence of comorbidities, occurs in a minority of cases,[26,28] even in population samples.[29] Rates of specific comorbidities including learning disabilities,[30–33] anxiety,[31,34] depression,[34,35] and conduct disorder,[31–34] were broadly within the ranges currently reported from regional and clinical samples.

We observed steep social gradients for comorbidities. Poor children with ADHD had close to 4 times the risk of 3 or more comorbid conditions compared with the most affluent. Few studies examine ADHD comorbidity for poor children, although 1 study of Finnish adolescents found more comorbid externalizing disorders.[16] Findings are consistent with a broader literature demonstrating that multiple health vulnerabilities, including physical health problems and psychosocial conditions like ADHD, tend to cluster together for children from families with lower socioeconomic status.[36–40] Because children from low-income families typically have less access to health services, "over-diagnosis" of comorbidities in poorer children with ADHD is unlikely. One plausible explanation is that ADHD and other examined conditions could have certain common etiologic factors (eg, genetic susceptibility,[41,42] maternal stress,[43,44] and prenatal smoke exposure[44,45]) that are more prevalent in families with lower income.

Consistent with previous literature, children with ADHD had more problems across a wide range of school, social, and family functioning indicators.[4,46,47] This study is novel in showing steep gradients, with each additional comorbid disorder associated with worse functioning across all domains, even controlling for sociodemographics. Children with ADHD and 3 or more comorbidities, corresponding to more than 700 000 children nationally, had particularly severe functional deficits. The very high prevalence of school problems (81%) and grade repetition (46%) indicates that existing management strategies are falling short of meeting the needs of these children. Grade repetition may substitute for more customized, proactive individual interventions. High parent-child communication problems and parent aggravation indicate that families need additional supports to maintain good quality relationships with their children and might benefit from individual and family counseling.[48–50]

The relationship between family income and functioning in children with ADHD has not been well studied; however, more hyperactivity and peer problems have been reported in children from lower income households.[4] We found steep income gradients in social and educational functioning for children with ADHD. Reasons underlying these gradients were beyond the scope of this study, but the relative contributions of access to health and educational interventions, and presence of comorbidities need additional research.

Our findings have several implications for practice. First, comprehensive screening for other problems that occur with ADHD is necessary, and treat-

ment profiles should be tailored by comorbidity status and levels of functional impairment in home and school settings.[51–54] Current AAP guidelines call for assessment and management of comorbidity with ADHD.[55,56] Most physicians report screening for common comorbidities such as depression,[57] but only 20% agree that they are adequately trained to treat children with ADHD and comorbidity.[58] A need for more supports to establish a chronic disease management approach also is suggested by studies, including written intervention plans tailored to each child's neurodevelopmental profile and protocols for follow-up monitoring/assessment of functioning.[58,59] Children from families with a lower socioeconomic status had more comorbidity and impaired functioning, which indicates more intensive assessment and treatment from the start to help manage their illness are needed. Finally, health and educational service use increased for children with ADHD and multiple comorbidities, and nearly half of parents reported a need for more care coordination with complex comorbidity. These findings reinforce a need for greater integration of primary care with mental health, education, and social services.[60–62]

Study limitations include parent report and the cross-sectional nature of the data, which precludes inferences about cause. The parent-reported diagnosed prevalence of ADHD was consistent with estimates using other methods; however, we could not gauge the possible rate of false-positives or false-negatives in the sample. Parent reports have been widely used in the literature,[63–66] and our comorbidity patterns were similar with clinical and regional studies. This gives us confidence our results are valid representations of comorbidity and related consequences for children diagnosed with ADHD in the US. Our study did not address medication use or specific behavioral interventions, and we could not determine whether ADHD developed before or after onset of the comorbid conditions. Our study is novel in demonstrating steep increases in impairment and service use with multiple comorbidities, and future research should expand this by examining costs. Study strengths include the large, nationally representative sample and data on a wide range of comorbidities, affording a unique opportunity to explore relationships between comorbidities, functioning, and service use at the population level.

CONCLUSIONS

Professionals and parents need to be aware of the high prevalence of mental health/neurodevelopmental comorbidities among school-aged children with ADHD in the United States. Patterns of worsening function with increasing numbers of comorbidities reflect the challenge of meeting the needs of children with complex clinical pictures within the current system of care. Comparative effectiveness studies of primary care treatment strategies for ADHD in children have been identified as an Institute of Medicine priority.[67] Our findings indicate that such studies are urgently needed. Testing innovative models of care integration across health, mental health, educational, and social domains would be a fruitful area of research to determine the best management approach, especially for those children at greatest risk of poorer function.[60–62,68–71]

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